Robot Drive Motor Characterization Test Plan

PackBot Modernization Project

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9/21/2012

This test plan is intended to characterize the drive motors of a small robot with respect to voltage and current under multiple slopes conditions.

REPORT DOCUMENTATION PAGE   UNCLASSIFIED

Form Approved
OMB No. 0704-0188

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1. REPORT DATE (DD-MM-YYYY) 26-09-2012	2. REPORT TYPE Technical Report	3. DATES COVERED (From - To) 18-09-2012 – 26-09-2012

4. TITLE AND SUBTITLE

Robot Drive Motor Characterization Test Plan – PackBot Modernization Project

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
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5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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8. PERFORMING ORGANIZATION REPORT NUMBER

DTIC

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
US Army Tank-Automotive Research, Development, and Engineering Center, Warren, MI

10. SPONSOR/MONITOR'S ACRONYM(S)
RDECOM-TARDEC

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES
The views, opinion, and/or findings contained in this report are those of the authors and should not be construed as an official Department of the Army position, policy, or decision, unless so designated.

14. ABSTRACT
A test plan to measure voltage and current of active drive motors on a small robot under repeatable test conditions. Several positive and negative slope conditions are included.

15. SUBJECT TERMS
Robot, Modernization, Motor Test, Characterization

16. SECURITY CLASSIFICATION OF: UNCLAS DIST A			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Ty Valascho
a. REPORT Dist A	b. ABSTRACT Dist A	c. THIS PAGE Dist A	A	8	19b. TELEPHONE NUMBER (include area code) 586-282-0681

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

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Contents

Objectives

The purpose of this test is to measure voltage and current of active drive motors under repeatable test conditions. Several positive and negative slope conditions are included.

Requirements

Special equipment

- Datalogger
- Stopwatch
- Ambient temperature measurement device

Site requirements

- Incline surfaces at 15, 20, 25, and 30 degrees with grass or equivalent surface

Procedure

Repeat each of the following test conditions 3 times. This results in 3 separate trials of Test Condition 1, Test Condition 2/3, Test Condition 4/5, Test Condition 6/7, and Test Condition 8/9.

Test Condition 1: Level ground, zero longitudinal inclination

1. Start robot and OCU with current and voltage measurement device for one main drive motor.
2. Record ambient temperature, date and time of test.
3. Using the OCU, drive the robot to an open, flat area with 0 degree slope and set the vehicle speed to Creep.
4. Begin logging.
5. Drive in the forward direction for approximately 15 seconds at full throttle.
6. Pause for approximately 5 seconds.
7. Drive in reverse for approximately 15 seconds at full throttle.
8. Pause for 5 seconds.
9. Set the vehicle speed to Normal.
10. Drive in the forward direction for approximately 15 seconds at full throttle.
11. Pause for approximately 5 seconds.
12. Drive in reverse for approximately 15 seconds at full throttle.
13. Pause for 5 seconds.
14. Set the vehicle speed to Fast.
15. Drive in the forward direction for approximately 15 seconds at full throttle.
16. Pause for approximately 5 seconds.
17. Drive in reverse for approximately 15 seconds at full throttle.
18. Stop logging.

Test Conditions 2 & 3: 15 degree longitudinal inclinations, positive and negative

1. Start robot and OCU with current and voltage measurement device for one main drive motor.
2. Record ambient temperature, date and time of test.
3. Using the OCU, drive the robot to the base of the 15 degree hill and set the vehicle speed to Creep.
4. Begin logging.
5. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
6. Pause for approximately 5 seconds.
7. Drive down hill in reverse for approximately 15 seconds at full throttle.
8. Pause for 5 seconds.
9. Set the vehicle speed to Normal.
10. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
11. Pause for approximately 5 seconds.
12. Drive down hill in reverse for approximately 15 seconds at full throttle.
13. Pause for 5 seconds.
14. Set the vehicle speed to Fast.
15. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
16. Pause for approximately 5 seconds.
17. Drive down hill in reverse for approximately 15 seconds at full throttle.
18. Stop logging.

Test Conditions 4 & 5: 20 degree longitudinal inclinations, positive and negative

1. Start robot and OCU with current and voltage measurement device for one main drive motor.
2. Record ambient temperature, date and time of test.
3. Using the OCU, drive the robot to the base of the 20 degree hill and set the vehicle speed to Creep.
4. Begin logging.
5. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
6. Pause for approximately 5 seconds.
7. Drive down hill in reverse for approximately 15 seconds at full throttle.
8. Pause for 5 seconds.
9. Set the vehicle speed to Normal.
10. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
11. Pause for approximately 5 seconds.
12. Drive down hill in reverse for approximately 15 seconds at full throttle.
13. Pause for 5 seconds.
14. Set the vehicle speed to Fast.
15. Drive up hill in the forward direction for approximately 15 seconds at full throttle.

16. Pause for approximately 5 seconds.
17. Drive down hill in reverse for approximately 15 seconds at full throttle.
18. Stop logging.

Test Conditions 6 & 7: 25 degree longitudinal inclinations, positive and negative

1. Start robot and OCU with current and voltage measurement device for one main drive motor.
2. Record ambient temperature, date and time of test.
3. Using the OCU, drive the robot to the base of the 25 degree hill and set the vehicle speed to Creep.
4. Begin logging.
5. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
6. Pause for approximately 5 seconds.
7. Drive down hill in reverse for approximately 15 seconds at full throttle.
8. Pause for 5 seconds.
9. Set the vehicle speed to Normal.
10. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
11. Pause for approximately 5 seconds.
12. Drive down hill in reverse for approximately 15 seconds at full throttle.
13. Pause for 5 seconds.
14. Set the vehicle speed to Fast.
15. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
16. Pause for approximately 5 seconds.
17. Drive down hill in reverse for approximately 15 seconds at full throttle.
18. Stop logging.

Test Conditions 8 & 9: 30 degree longitudinal inclinations, positive and negative

1. Start robot and OCU with current and voltage measurement device for one main drive motor.
2. Record ambient temperature, date and time of test.
3. Using the OCU, drive the robot to the base of the 30 degree hill and set the vehicle speed to Creep.
4. Begin logging.
5. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
6. Pause for approximately 5 seconds.
7. Drive down hill in reverse for approximately 15 seconds at full throttle.
8. Pause for 5 seconds.
9. Set the vehicle speed to Normal.

10. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
11. Pause for approximately 5 seconds.
12. Drive down hill in reverse for approximately 15 seconds at full throttle.
13. Pause for 5 seconds.
14. Set the vehicle speed to Fast.
15. Drive up hill in the forward direction for approximately 15 seconds at full throttle.
16. Pause for approximately 5 seconds.
17. Drive down hill in reverse for approximately 15 seconds at full throttle.
18. Stop logging.

Robot Drive Motor Characterization Log Sheet

a. **Test Condition 1: Level ground, zero longitudinal inclination**

   Date

   Time

   Ambient Temperature (C):

   Data file name:

b. **Test Conditions 2 & 3: 15 degree longitudinal inclinations, positive and negative**

   Date

   Time

   Ambient Temperature (C):

   Data file name:

c. **Test Conditions 4 & 5: 20 degree longitudinal inclinations, positive and negative**

   Date

   Time

   Ambient Temperature (C):

   Data file name:

d. **Test Conditions 6 & 7: 25 degree longitudinal inclinations, positive and negative**

   Date

   Time

   Ambient Temperature (C):

   Data file name:

e. **Test Conditions 8 & 9: 30 degree longitudinal inclinations, positive and negative**

   Date

   Time

   Ambient Temperature (C):

   Data file name: